ASSESSMENT OF COPING STRATEGIES AMONG RICE FARMERS IN RESPONSE TO CLIMATE VARIABILITY IN TARABA STATE OF NIGERIA

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ABSTRACT
This study assessed coping strategies among rice farmers in response to climate variability in Taraba State Nigeria.; random selection of rice farmers according to the proportion of their population were used to select four hundred and eighty (480) rice farmers from thirty-two selected communities Analysis of data were carried out using descriptive statistical tools and Principal component analysis. from the findings of the socio-economic characteristics of the rice farmers (29%) are between 31-40 years that majority (78%) are married; great proportion (82%) were males Majority (82.4%) has formal Education at varying levels ranging from primary to tertiary levels; (26.3%) has the household size of 5-6 while (45.8%) has less than or equal to 2 hectare of land that is used in farming rice Majority (77.7%) had farming experience of less than or twenty years Majority (77.9%) of the rice farmers harvested between 100 and below bags of rice in the last cropping season (76 %) of the rice farmers had no contact with extension agent, majority (89 %) of rice farmers do not belong to cooperative society.in coping with climate variability, rice farmers in the study area had developed and practiced several coping strategies that is considered necessary to cope with the impact of climate variability .In constraints face by rice farmers, the variables in the analysis were explained in five components and all the five component have eigenvalue higher than 1 that shows that rice farmers face all the constraints stated in the variables. Based on the findings the following recommendations were made; Assessment should be carried out on coping strategies rice farmers are currently using to cope with climate variability including any traditional practices to know the effective ones.it is advised that this findings be shared among rice farmers and other stakeholders in other location in the zone. Financial and institutional constraints is one of the highest constraints face by rice farmers in the study area there Government should provide required assistance to farmers by training them on new innovations on coping strategies technologies for effective rice production.

Keywords: Assessment, climatic variability, coping strategies, rice farmers

INTRODUCTION

Climatic variation refers to the average condition of the climate across different time frames and geographical areas of weather events. Climate variability represents the changes in ecosystem structures that occur as a result of human land utilization and the potential for human livelihoods. Food and Agriculture Organization (2018) defined Climate variability as fluctuations in the climatic conditions of a region compared to its long-term average. Olson (2018) defines Climate Variability as the variations in climate elements such as drought, excess/ shortage rainfall, temperature, wind, flood, Wildfires, erosion, and other human activities that contributed to climate variability.

Rice is a ubiquitous staple crop, serving as a

primary dietary component for more than half of the world's population thereby playing a vital role in global food security and sustain the livelihoods of billions of people worldwide especially the inhabitants of Africa and Asia (Aryal, Jat, Sapkota, Khatri-Chhetri, Kassie and Maharjan, 2018). It is widely cultivated and consumed almost everywhere in the world.

Coping strategies denote a suite of short term measures employed by agricultural stakeholders particularly farmers to mitigate the deleterious impacts of climate variability on their livelihoods and farming systems. Coping strategies according to The Intergovernmental Panel on Climate Change (2017) is the ability of a system to adjust to variability and extremes, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. Coping are adjustments or interventions, which take place in order to manage the losses or take advantage of the opportunities presented by climate variability

According to Tontus (2020) Assessment is the process of gathering and discussing information from various sources and activities in order to garner a profound understanding of an individual cognitive and practical abilities, it is essential to explore the intricacies of their experiential knowledge thereby revealing the depth of their comprehension and the extent to which they can apply their knowledge to practical contexts.

Climate variability has become a worldwide issue as it is responsible for creating an adverse effect on the environment. It is one of the major environmental factor affecting the growth and yield of crop. As reported by Babatolu and Akinnubi (2016) Nigeria is presently grappling with the far-reaching consequences of climate variability, which manifest as intensified heavy rainfall events, erratic precipitation patterns, unpredictable onset and cessation of rainy seasons and rising air temperatures. Existing literature for example, Kayode, Awoyemi and Alabi (2022); Preference of rice farmers' coping strategies to environmental hazards in Kwara State Nigeria, and Uloh, Ume and Ede (2023) Climate Change Adaptation Strategies and its Coping Choice by Rice Farmers in Anambra State, Nigeria. However none has be done on Coping Strategies among Rice Farmers in Response to Climate Variability in Taraba State, Nigeria.

Existing studies mostly focus on growth period and productivity of crops, but the concern of the society now is crop product quality and safety; the research content and objective cannot meet the new requirements of improving the quality and efficiency of Nigeria Agriculture. However, the impact of climate variability and the response of how farmers cope with it is also significant, and there are significant differences between how each farmers uses different types of strategies to cope with it. North -East Nigeria is a significant rice-producing region. Taraba State the highest rice producing area in that region and it requires economic development and stability. There are gaps in understanding climate change impacts and coping strategies in that region. The current variability in climate is not a uniform process of warming and frequent extreme weather but disaster events have increased the risk to agricultural production, resulting in the need to set up an extreme weather early warning and forecasting system, such as for heavy rain, seasonal drought, extreme temperature, and other natural disasters, that will reduce the risk of disaster. Therefore, considering the research gap and significance, this study is particularly focused on the rice-growing zone in the North East, Taraba State. A region facing a decline in rice yield, and intends to explore how farmers cope with climate variability and the constraints face when coping with climate variability. The study seeks to address the gap by conducting an Assessment of Coping Strategies among Rice Farmers in Response to Climate Variability in Taraba state of Nigeria. The broad objective of the study is to assess the coping strategies use by rice farmers in response to climate variability

The specific objectives were to

I. describe the socio- economic characteristic of the rice farmers in the study area
ii. identify the coping strategies used by rice farmers in the study area
iii. identify constraints face by rice farmers in coping with climate variability in the study area

Materials and methods

Study Area

The study was conducted in Taraba state in the North –East Nigeria. Taraba state is located between latitude 6°25'N to 9°30'N and longitude 9°30'E to 11°45'E with tropical continental climate with a land area of 60,291km2 as second largest in Nigeria in terms landmass with population of over 2.3 million people according to 2006 population census and growth rate of 3.1% per annum. The North-eastern zone of Nigeria has an annual average temperature of 40°C, The average annual rainfall of the zone varies between 500 mm in the extreme north and 12000 mm in the southern sub region (Mayomi and Yelwa, 2019).

Data collection

Both secondary and primary data were used for the study. Primary data was collected using a well-structured questionnaire that was developed in English language and administered to those farmers who can read and write, however the questions were translated to local language during interview by Taraba State Agricultural Development Programme enumerators / extension agents who understand their local languages that were trained and contracted. Data were collected on socio-economic characteristics of the rice farmers, coping strategies used and the constraints faced in coping with climate variability in the study area.

Methods of Data Analysis

Descriptive statistics were used to analyze the socio- economic characteristics; the coping strategies used by rice farmers and Factorial analysis, also known as principal component analysis, (PCA) was used to analyze the constraint faced by rice farmers in coping with climate variability in the study area. Statistical Packages for Social Science (IBM SPSS) version 25 was used to analyze the data. Statistical Packages for Social Science (IBM SPSS) version 25 was used to analyze the data.

Result and Discussion

Socio-economic characteristics of the rice farmers in the study area

Table 1 shows the age of the rice farmers in the study area. The results indicate that (29%) are between 31-40 years, (26%) are between 41-50 years of age. This implies that farmers in the study area were relatively young and physically active. Age is influenced by the ability of farmers in the use of different climate variability coping strategies in order to increase rice production. This findings is in line with Yakubu, Akpoko, Akinola and Abdulsalam, (2021) who reported that farmers in their study area are within the age of 31- 50 years. The findings in table 1 shows the marital status of the rice farmers in the study area. The results indicates that majority (78%) are married. This implies that more married people are involved in rice cultivation. One important aspect of farmers' life is marriage. Rice is the source of livelihood for the farm families. Having more married people in farming can bring numerous benefits, including increased stability, productivity and sustainability. The findings agreed with Agyo and Ornan (2018) who stated that more married people are involved in rice farming in their study area. The results in table 1 revealed that a great proportion (82%) of the rice farmers in the study area were males whereas (18%) were females, this suggest that rice farming in the study area was dominated by male farmers. Findings in this study correspond with previous report of various studies that rice production was dominated by male. The findings agrees with

Ismail (2023) and Agyo and Ornan (2018) who reported that the agricultural sector and the tedious activities related to climate variability coping strategies are dominated by males and in contrast with the findings of Adeleye, (2016) who reported more female compared to male rice farmers in his study area. The result in table 1 presents the educational level of the rice farmers in the study area. Majority (82.4%) has formal Education at varying levels ranging from primary to tertiary levels; tertiary education has (38.1%) implying that farmers in the study area have acquired one form of formal education or the other. This result is in agreement with Aboki, Luka, Jonathan and Rukwe (2020) which reported that majority of farmers in their study area has formal education. The household level of the rice farmers in the study area is presented in table from the findings (26.3%) has the household size of 5-6 while (21.5%) has 11 and above household size. The mean household sizes in their study area were about 11, 14 and 19 respectively. The findings disagreed with the study of Yakubu, Akpoko, Akinola, and Abdulsalam (2021) which find out that majority of his respondents has large household size. It is believed that large household size provide cheap labour that will help in the activities to cope with climate variability (Abaje, Sawa, and Ati, 2014). The results in table 1 also shows the result of the farm size in hectare of the rice farmers in the study area. Majority (45.8%) has less than or equal to 2 hectare of land that is used in farming rice. This implies that rice farming in the study area is dominated by small scale farmers. This findings is in agreement with Ismail (2023) who reported that rice farming in his study area is in small scale. The results in table 1 revealed the farming experience of the rice farmers in the study area. Majority (77.7%) had farming experience of less than or twenty years of farming experience. This shows that none of the rice farmers were new to farming. When it comes to farming generally, experience often outweigh age in value as the adage goes experience is the greatest teacher. This findings is in line with the work of Isibor, Orji and Izunwa (2024) who reported that the average farming experience of the respondents in their study area was 15 years.

Table 1 Socio economic characteristics of the rice farmers in the study area (n=480)

Variables	Percentages
Age	
less than 20 years	6.00
21-30	11.00
31-40	29.00
41-50	26.00
51-60	19.00
60 and above	9.00
Marital Status	
Single	18.00
Married	78.50
Gender	
Male	82.00
Female	18.00
Level of education	
Non formal education	24.60
Primary	27.30
Secondary	17.10
Tertiary education	38.10

Household size	
<=2	13.10
3-4	12.70
5-6	26.30
7-8	11.50
9-10	15.00
11 and above	21.50
Farm size	
<=2	45.80
3-4	22.30
5-6	24.40
7-8	5.40
9-10	1.05
11 and above	1.05
Farming experience	
<=20	1.50
21-30	12.75
31-40	8.10
41 and above	1.50
Harvested bag of Rice	
<=100	77.90
101-200	8.10
201-300	5.00
301-400	4.20
401-500	3.50
500 and above	1.30
Membership of farmers association	
Non members	89.00
Members	11.00

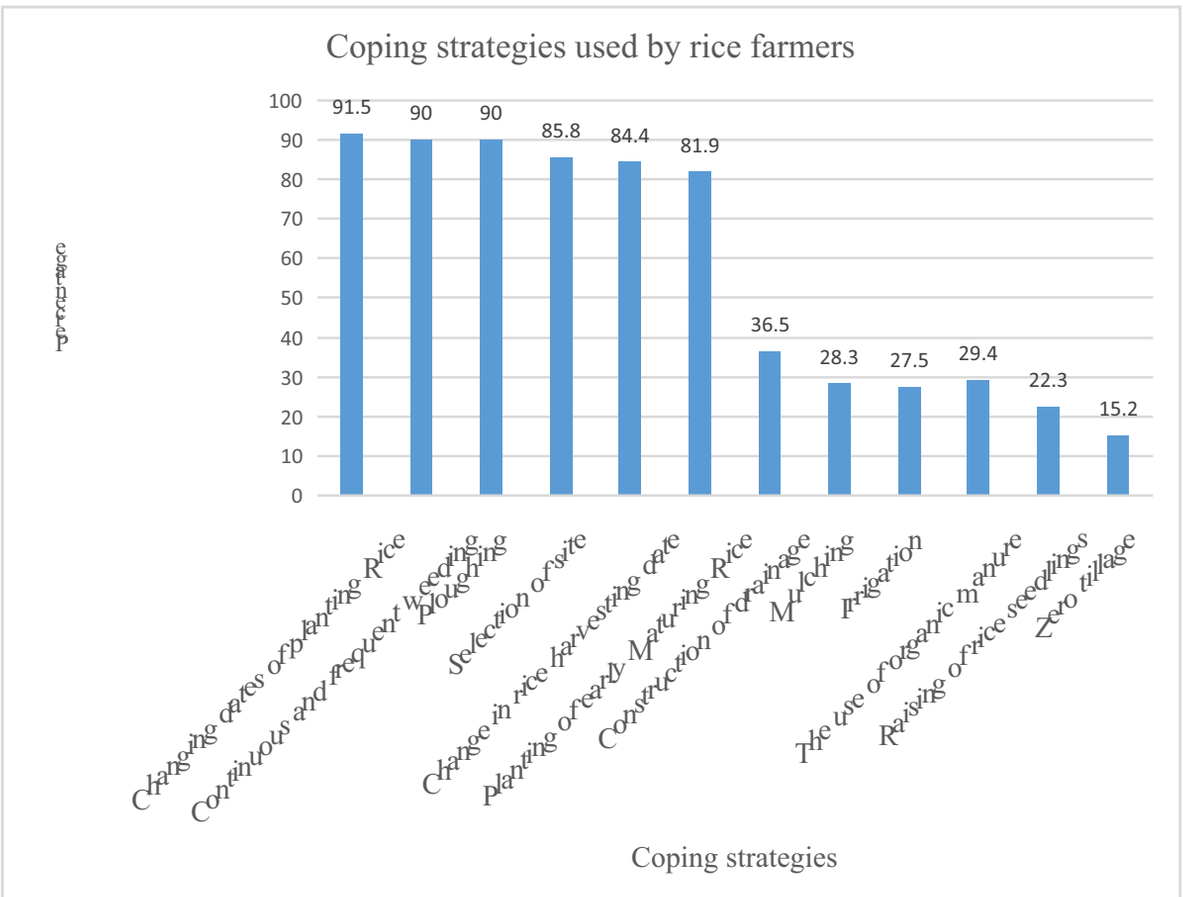
Source : Field Survey, (2024)

Coping strategies used by rice farmers to cope with Climate Variability

Results figure 1 indicates that majority (91%) of the rice farmers in the study area use Changing dates of planting Rice to cope with Climate Variability this implies to the situation in which rice farmers adjust the timing of rice planting or sowing in response to changes in climatic conditions such as temperature fluctuation, rainfall variability and drought. These is an indication that rice farmers in the study area had developed and practiced several coping strategies that is considered necessary to cope with the impact of climate variability. This findings is in line with Onyegbula and Oladeji (2017) who reported that rice farmers in their study area employ various coping strategies to address climate variability. These strategies include adjusting the rice planting calendar based on the onset of rainfall, utilizing mulch materials to conserve soil moisture. Also in figure 1 Ploughing and continuous/frequent weeding has (90%) usage. This is also known as no-till or conservation tillage. It is a farming practice that involves planting crop without tilling the soil. This implies the soil is not plowed or turned over. The findings is in agreement with Yeleliere, Antwi-Agyei and

Guodaar (2023) who discovered that Rice farmers in their study area used various types of coping strategies depending on the climatic manifestation. While zero tillage has (15.2%) coping strategies used by rice farmers to cope with climate variability in the study area, this is in contrast with Talaka (2023) who stated that ridging is not necessary and is often a waste of space that is zero tillage. States where the soils are more fragile and prone to erosion, minimum or zero tillage is recommended as a coping strategies.

Also findings from figure 1 shows that selection of site that is not prone to erosion has (85.8%). This is the process of choosing a location for rice cultivation that is not less likely to experience soil erosion. Furthermore result from figure 1 revealed that (84.4%) of the rice farmers in the study area used change in the rice harvesting date to cope with climate variability. Change in the rice harvesting date refers to adjusting the timing of rice harvesting in response to changes in climatic variables. Furthermore results from figure 1 shows that planting early maturing rice varieties is another coping strategies used by rice farmers in the study area with (81.9%). This refers to practice of growing rice varieties that mature quickly. This help farmers to adapt to shorter growing seasons. Although some early maturing varieties may have lower yield potential compared to traditional varieties. This result is in conformity with the finding of Mango, Makate and Mapemba (2018) which stated that early-maturing rice varieties was used to cope with climate variability in their study area. Consequently Deng, Chen, Feng, Chen, and Zhang, (2017) propose several strategies; they suggested that the cultivation of early maturing rice varieties can also be used to cope with climate variability. Fatou, Seydou, Adama and Yacouba (2020) also reported that majority of rice farmers in their study area has stopped cultivating traditional varieties because it is late maturing and prefer to use improved varieties that are early maturing. However, Amusa, Igwe and Oti (2020) reported that rice farmers in their study area used the following to cope with climate variability; creating drainage system in case of rice farm, flooding of nurseries in rice production is recommended as a method to help farmers adapt to climate uncertainties. From the results in figure 1, Construction of drainages is another coping strategies used by rice farmers to cope with climate variability in the study area with (36.5%) These is the process of building a drainage systems to manage excess water and reduce the risk of flooding, waterlogging and other climate related impacts. This finding agreed with Deng *et al.,* (2017) which stated that construction of local drainages was used by rice farmers to cope with climate variability in their study area.



Coping strategies used by rice farmers to cope with Climate Variability
Source: Field Survey, (2024)

Constraint face by rice farmers in coping with climate variability.

Presented in Table 2 is the principal component analysis of the constraints rice farmers face in coping with climate variability in the study area. Constraints refer to limitation, obstacles and challenges that rice farmers encounter when trying to cope with the impacts of climate variability on their rice crops. The result revealed that components 1, 2, 3, 4, and 5 have eigenvalues higher than 1. This means that the variables in the analysis were explained in the five components. These components cumulatively account for 59.92% of the variance in the variables, as shown in Table 2; this implies that these components were efficient in explaining the relationship between the variables. Component 1 represents financial and institutional constraints, including the following: credit constraints (0.811), labor constraints (0.720), inadequate extension services (0.740), low-level income (0.651), and inadequate government support (0.542). This component represents financial and institutional challenges, were limited credit access, inadequate government support, low income and inadequate extension services limit the ability of rice farmers to cope with climate change.

Table2:Total Variance of the Constraints faced by Rice Farmers in Coping with Climate Change

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.752	23.451	23.451	3.752	23.451	23.451	3.016	18.853	18.853
2	1.929	12.059	35.510	1.929	12.059	35.510	1.668	10.424	29.277
3	1.455	9.097	44.607	1.455	9.097	44.607	1.665	10.406	39.682
4	1.300	8.123	52.730	1.300	8.123	52.730	1.631	10.196	49.878
5	1.150	7.191	59.920	1.150	7.191	59.920	1.607	10.042	59.920
6	.941	5.882	65.802						
7	.815	5.093	70.895						
8	.742	4.638	75.533						
9	.667	4.170	79.703						
10	.628	3.923	83.626						
11	.579	3.618	87.244						
12	.546	3.411	90.655						
13	.499	3.119	93.774						
14	.392	2.450	96.224						
15	.305	1.909	98.133						
16	.299	1.867	100.000						

Extraction Method: Principal Component Analysis.

Source: Field survey, (2024)

This implies that financial and institutional constraints hinders rice farmers from getting the necessary resources to cope with climate variability. This result agrees with the findings of Asekun, Bamidele, Odu, Olugbenga, Abodurin, Adebimpe, Oladele, Adeomi, Adeoye, and Ojofeitimi (2014) who observed that financial, institutional and information constraints were the major hindrances face by farmers in coping with climate variability in their study area.

Component 2 represents access and land tenure issues and includes the following factors: inadequate access (0.705), land tenure issues (0.674), inadequate government support (0.418), and non-adherence (0.552). This group of constraints is related to infrastructure and land tenure challenges, indicating that farmers struggle with access to necessary resources, insecure land tenure, and inconsistent adherence to policies. This findings is in line with Ige, Olasanmi, Mbanjo, Kayondo, Parkes, Kulakow, Egesi, Bauchet, Lopez-Lavalle, Ceballos and Rabbi (2021). Component 3 consists of constraints that signify knowledge and training gaps. The following factors were loaded in the analysis. Inadequate training (0.777), ignorance (0.741), and illiteracy (0.499). This suggests that education, knowledge, and skills development are significant constraints, as farmers lack adequate training and are affected by illiteracy and limited awareness.

Component 4 indicates communication and

response issues, the item loadings include inadequate knowledge (0.679), and poor response (0.761), which represents challenges in communication and information dissemination. This findings is in agreement with Malabe, Yakubu, Ango, Barau and Haruna (2024) who stated that information and communication were the major constraints face by farmers to cope with climate issues in their study area. Component 5 consists of inaccurate forecast (0.751), illiteracy (0.643), and non-membership (0.590). This suggests that uncertainty in market and weather forecasts, along with weak social networks, pose significant challenges. Farmers who are not members of cooperatives or associations may struggle to access vital agricultural information, and this may influence their ability to cope with climate change. This findings is in agreement with Orji. *et al* (2024) who observed that lack of accurate information and insufficient fund hinders farmers from getting the necessary resources and technologies that will assist farmers to cope with climate variability in their study area.

Conclusion and Recommendations

The study Assessment of Coping Strategies among Rice Farmers in Response to Climate Variability in Taraba state of Nigeria. Climate variability and agriculture are both interrelated process. Rice farmers in the study used varieties of coping strategies to cope with climate variability. Constraints face by rice farmers in the study area are represented by five components. Each of the five components have eigenvalues higher than 1. This shows that rice farmers in the study area face all the constraints represented in the components. Based on the findings from the study, the following recommendations are made.

1. Assessment should be carried out on coping strategies rice farmers are currently using to cope with climate variability including any traditional practices to know the effective ones.
2. Changing dates of planting rice is one of coping strategies that is always used by rice farmers to cope with climate variability in the study area; this finding should be share with other rice farmers and other stakeholders in other location in the zone.
3. Financial and institutional constraints is one of the highest constraints face by rice farmers in the study area there Government should provide required assistance to farmers by training them on new innovations on coping strategies technologies for effective rice production in Taraba state

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